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imaginary migrations at imaginary times. The theory on which such migrations are founded is not ethnology at all, but philology run mad, and usurping the places of ethnology, of geography, and of history.

From all that has been stated in the course of this paper, the conclusion seems to me inevitable, that the earth could not have been peopled throughout from a single point of its surface, and from a single tribe or family, and that all the theories founded on this assumption are but the wild and incoherent dreams of learned and ingenious men, giving full rein to their imagination.

XXI.—*On the Sources of the Supply of Tin for the Bronze Tools and Weapons of Antiquity.* By JOHN CRAWFURD, Esq., F.R.S.

Read May 10th, 1864.

TIN, as is well known, is found only in a very few parts of the world, and these very remote from each other. The localities in which ores of it exist are, England, the Malayan Peninsula and adjacent islets, Northern China, Spain, Japan, and Peru. The three first, however, alone produce it abundantly, and, Spain partially excepted, are the only places that have reference to the question under consideration. The ore is always an oxyd and easily reduced by the help of a little charcoal under a strong heat, as attested by the metal having been produced in times beyond record by the rude industry of ancient Britons and Malays. Further facility was afforded by the ore, in early times, being always found in the drift or alluvium, dispensing with the necessity of seeking for it in the vein by mining. Such is still the case with the Malay ore, in whatever locality found; and it may be added that not only is the ore thus more cheaply obtained, but, when smelted, that it yields a purer metal.

The total quantity of British and Malayan tin yearly produced is probably at present not less than twelve thousand tons, out of which probably about two-thirds are the produce of the Malayan countries. These last constitute, indeed, by far the most extensive tin formation in the world, for it extends from the fourteenth degree of north to the third of south latitude. The great quantity at present produced is owing to the application of Chinese industry; a recent event, for in the times to which the present discussion refers the produce must have been small, for it was the result of rude native industry, at a time long before the migration of the Chinese had taken place. Of the quantity of tin pro-

duced in China we know nothing ; but it is probably large, for the Malayan tin imported is probably confined to the consumption of the southern and midland provinces.

To speculate on the sources from whence the nations which used bronze for tools and cutting instruments derived their tin, is a subject of archæological, even of historic, and hence of ethnological interest. There are but three principal sources from which the nations of ancient Europe could have derived it, namely, Britain, the Malayan countries just described, and Northern China. Spain in early times may have furnished a small supply, but the ore is not abundant in that country. In rude times the commercial intercourse of nations is from necessity conducted by successive slow and expensive stages,—sometimes by land, and sometimes by sea. It was by such a tedious and costly course that the silk of China, the pepper of Malabar, the cinnamon of Ceylon, and, eventually, the cloves and nutmegs of the remote Spice Islands reached the nations of the West, both Asiatic and European. In some of the ancient tombs of Egypt there have of late been found small porcelain phials, with the hieroglyphics of China clearly and legibly inscribed upon them ; a fact attesting the great antiquity of the commercial intercourse between the Eastern and Western world.

I may presume that the tin necessary for the formation of bronze would be supplied in the same manner as silk and spiceries. but in this case it would come from two quarters, from the West as well as from the East. The merchants dealing in them would convey their commodity as far as it fetched a profit, until Western and Eastern tin met at a central point, where the two articles would be nearly of the same price. I venture to name Egypt as likely to be that point. All the nations west of it would be supplied with British, and all those east of it with Malayan or Chinese tin. In this, of course, there would be much oscillation, depending from time to time on the political condition of the respective countries through which the tin had to pass. The British tin would be conveyed by land to the Channel, and crossing it, reach France, and through France find its way to Italy, Greece, and Egypt.

With Sir Cornewall Lewis, I utterly disbelieve in the voyages of the Phœnicians to the Scilly Islands, and through which they are imagined to have supplied the Eastern world with Cornish tin. To say nothing of the whole length of the Mediterranean, if the voyage were direct from Tyre, that from its western issue to the south-western extremity of Britain would extend in a straight line to one thousand nautical miles, and this in the open ocean with variable winds and inevitable storms. Even within the tideless and comparatively pacific Mediterranean the Greeks

and the Phœnicians could not do otherwise, but crept along the coast, hauling their craft ashore in foul weather. The course of ancient navigation is well described by Sir Cornewall Lewis in his *Treatise on the Astronomy of the Ancients*. "The general system of navigation in antiquity," says he, "whether the vessel was impelled by sails or by oars, was to keep close to the shore and never venture into the open sea, except in order to reach an island or to cross a channel of moderate width. Navigation was, moreover, suspended during the winter months. An ancient vessel crept along the shore, advanced merely from one point or landing-place to another, stopped at night, when the difficulty of steering was greater, and took in water and food at the successive stages. The mean rate of a day's sailing (exclusive of the night) is estimated by Rennell at about thirty-five miles, and at every interval of this length it put in to land."

Pursuing the voyage in this fashion, the Phœnician navigators sailing to the Scilly Islands must have crept along the western and northern coast of the Spanish Peninsula, with the whole western coast of France, and crossed the British Channel in its widest part. Such a voyage would extend, with a fair wind throughout, over at least 1,400 miles.

Reaching the Scilly Islands, the supposed Cassiterides, a sea so tempestuous of westerly or adverse winds would be encountered, that it is reckoned that not more than six calm days are experienced within the year. But, still worse, the supposed Tin Islands afford no evidence of their having ever produced tin, which, if they were frequented for this metal, must have been brought to them from Cornwall. It must, indeed, be admitted, that the very name of Tin Islands, applied to places which produced no tin, wears a very mythic aspect.

No doubt voyages of even greater length are now performed, and for many ages had been performed, even before the invention of the compass, and this in vessels not superior to those of Greeks and Phœnicians, by oriental mariners; but then it is done by help of the monsoons, that is, with a fair wind in the outward and in the homeward voyage, and in seas which, avoiding the equinoxes, are never vexed by storms. In fact, there is no evidence to show that either Greeks or Phœnicians ever passed the Straits of Gibraltar, and it is certain that neither of them formed such colonies as both did on the coasts and islands of the Mediterranean. Of the navigation of the two nations, that of the Greeks was the most enterprising, as is shown by the colonies which they planted on the shores of the Dardanelles, the Sea of Marmora, the Bosphorus, and the Euxine, localities never even visited by the Phœnicians, unless under compulsion, as auxiliaries to a Persian despot. I may add one other argument

against the supposed commercial adventures of the Phœnicians to the Cassiterides or Tin Islands. A vessel could not be entirely loaded with tin : that article could only be used as dead weight or ballast, and to make up what in commercial language is called an assorted cargo, what other commodities worth the cost of a distant transport could Cornwall or even Britain have yielded at the remote time when the Phœnician voyages to Britain are imagined to have been performed ? Britain had neither available gold or silver or pearls, furs or spices, the usual paying merchandise in such cases. The distance would be too great even for the conveyance of slaves.

With respect to the manner in which the Malayan tin was distributed in early times, the question is necessarily full of obscurity. When the Portuguese first visited Malacca, then close to the principal tin mines (for the rich ores of Banca were not discovered until two centuries later), they there found the native shipping of the Coromandel coast of India, and the junks of China and even of Japan, the conductors of the trade between these countries and the Malayan Archipelago, and tin an article of their return cargoes. It was most probably by the same source that India and Southern China, with the countries adjacent to them, were from time immemorial supplied with the tin that enabled them to manufacture their bronzes and bell-metal. It is from the same source that India and China are at present supplied ; the only difference being that the supply is larger and the price lower. Neither India, China, nor their adjacent countries are at all likely in ancient times to have received any part of their supply from remote Britain ; and China, independent of what it might receive from abroad, had its own indigenous supply. Such being the case, they could only have received it from the Malayan countries. China would receive Malayan tin through its own junks, and India through the Gentoo traders of the Coromandel coast ; as was the case when the Malayan tin-producing countries came first under the eyes of Europeans in the early years of the sixteenth century.

There is one ancient document which seems to me to corroborate this view of the manner in which India was supplied with tin. This is the *Periplus* of the Erythræan Sea ; that is, an account of the trade and trading ports of the ocean which lies between the Red Sea and the western coast of India. The *Periplus* has neither an author's name nor a date, but from internal evidence is believed to have been the work of a Greek merchant of Egypt of the time of the Roman occupation of that country. Notwithstanding this, the information which it gives, although meagre, has an air of much authenticity, from which it may be inferred that the writer speaks from personal observation.

He tells us that on the western coast of India, the extreme eastern limit of the trade which he describes, there were two principal emporia, namely, Baragaza or Barygaza to the north, and Barake or Bascare to the south; and he enumerates the articles of trade dealt in at both places, which are nearly the same. Dr. Vincent, in his *Commentary on the Periplus*, attempts to divide these technically into imports and exports; from which we might be led to infer that the first were all foreign productions brought across the Erythræan Sea, and the last native productions of India. There is, however, really no foundation for such an inference; for in a commercial emporium, where the merchandise of many countries is collected, the imports and exports must in the great majority of cases be one and the same; or, in general, an article must be imported before it is exported. The imports of the *Periplus* would, of course, include the commodities brought from all countries as well as those brought from the Arabian Gulf; and the course by which they are brought to the Indian emporia can only be discovered by the character and nature of the articles. When we find, for example, Italian and Sardinian wine, with precious coral, named among the imports, we may be certain that they were brought from about the countries on the Mediterranean; and when we find coarse glass enumerated as an import, we may suspect that it came from Egypt, since we know of no other country in which the manufacture of that article was at the time understood. When specie, that is gold and silver, is stated as a large import, we cannot hesitate to conclude that it was brought by the Greek traders from Egypt, since India has neither gold nor silver of its own, and has, in all known times, been supplied from the Western World. When we find black pepper among the exports, and in such quantity as to demand larger vessels than usual, we may be sure that this is a local production, and not an imported article, since one of the ports, the most southern, is described as situated in the proper country of Malabar, the parent locality of the black pepper vine. The same may be said of ivory, since elephants still exist in the forests of Malabar, and in the time of the *Periplus* were probably far more numerous. Large quantities of common cotton cloths are included among the imports, and some "fine muslins," but these are stated to have been brought from the interior for exportation. The western coast of India is not now, and is never known to have been, a country remarkable for the cotton manufacture; and we may hence conclude that the ordinary cloths alluded to came from the eastern side of the Peninsula, and the "fine muslin" all the way from Bengal, the only part of India that has ever been known to produce it.

Among the exported articles are "fine pearls." The coast of

Malabar produces no pearls, fine or coarse, and therefore the pearls must have been imported before they could have been exported. They were probably brought chiefly from Ceylon, but may in part, also, have come from the fisheries of the Persian Gulf. Tortoise-shell, although called an export, is expressly said to have been brought from certain islands not remote from the western coast of India, and reasonably concluded to be either the Laccadive or Maldive Islands, still frequented by the turtle for incubation, but in early times, or of less active demand, probably far more so.

Porcelain is an article described as coming from the interior for exportation at Baragaza, or the northern emporium. Porcelain is not now, and there is no record of its ever having been, a manufacture of India, or, indeed, of any country nearer than China. We may therefore conjecture that it was brought by Chinese junks to the Malayan emporium of the day, from thence carried by Hindu traders to the coast of Coromandel, from which it would be conveyed overland to the emporia on the western coast, to find its way with the easterly monsoon to Egypt—which was the way in which the well-authenticated Chinese porcelain phials beforenamed reached the ancient tombs of Egypt. At present the ordinary porcelain of China is largely distributed over all the islands of the Indian Archipelago, but I am not aware that it is carried to India.

But the most remarkable fact connected with the Indian trade, as described in the *Periplus*, regards silk. At the northern of the two emporia it is called an import, and at the southern an export; but it is named Sericum, that is, Chinese, and is expressly stated to be the production, not of India, but of a country lying east of it. The western coast of India has never produced either raw or wrought silk; and, except Bengal, no part of India ever has. The silk, however, is said to have been “fine silk,” and this would not apply to that of Bengal, and could only do so to that of China.

But to come to the main point, the distribution of tin, in so far as India is concerned. The article is described at both of the Indian emporia as an import, but this would equally apply to it whether it came from the West and was British, or from the East and was Malayan or Chinese. No hint of its origin is given, but it is named along with lead, brass or bronze, cinnabar or sulphuret of mercury, and orpiment or sulphuret of arsenic. None of these articles are products of India any more than is tin itself, but they are all products of China, and exported from it down to the present time. In the course of the trade which I have already described, all these commodities may have reached an emporium of the Malayan Archipelago, whose tin being added to

them, they would all reach India together. The *Periplus*, I may observe, takes no notice of iron or steel; from which we may conclude that both India and Egypt were well supplied with these metals, and had no need of each other's assistance. Neither is there any mention of copper, so that we are at loss to know how India was supplied with this metal, unless from its own mines.

XXII.—*On the supposed Infecundity of Human Hybrids or Crosses.* By JOHN CRAWFURD, Esq., F.R.S.

(Read June 21st, 1864.)

CONNECTED with hybridity, a theory has lately sprung up and chiefly obtained currency in France and America. This supposes that the mongrels resulting from the union of two different races of the human family ought to be sterile, as is the case with the progeny of two opposite species of the same genus of the lower animals; and to give an example, one of the advocates of the doctrine goes the length of asserting that the continuation of a race of mulattos is as impossible as the continuation of a race of mules. I am satisfied that this theory is without a shadow of foundation, and I shall devote this short paper to an exposure of the conspicuous fallacies on which it is founded.

The theory is, of course, not tenable in so far as concerns the races of Europe, since here we see the most mongrel nations not only equal to those the least mixed, but even in advance of them in strength, civilisation, and numbers: witness the French and the English, with their American descendants. But even when the races of man are the most widely different, no infertility can be traced in their mongrel descendants, and of this examples in abundance can be produced from every quarter of the globe; and I may here observe that the crosses themselves, wherever found, are wholly unconscious of the incapacity which the theory would ascribe to them.

In the countries lying on the African side of the Mediterranean, the native country of the ancient Numidians and Mauritanians—the modern Berbers and Kabyles—there has been a great intermixture of many races going on for at least 2,000 years. Italians, Greeks, Vandals, and above all Arabs, have mingled their blood with that of the aboriginal inhabitants; but no one pretends that the cross races are less fertile than the parent stocks from which they have sprung. The modern Turks assuredly are a very mongrel people. They arrived in Western Asia and Europe for the most part without their families, and since intermarried with